MAXIMIZED PREFABRICATION FOR MINIMIZED BUSINESS RISK

The Cubes are complete, fully functional power plants with all the auxiliaries and components that a power production unit requires.

The scope of supply is a cubical construction with radiators on the roof and an exhaust gas stack either situated close to the cube or integrated within it. Each cube is delivered complete with all the components and structures located above ground. Only the concrete foundation on which the assembly rests is built locally, thus significantly reducing the customer’s responsibility.

FAST, FUNCTIONAL AND FLEXIBLE

For industrial self-generation, small utilities, industrial and IPP customers who do not have major construction and project-handling resources, a complete power production unit requiring minimum work on site is the answer. The installation of a Power Cube is rapid and easy. Plant start-up is fast thanks to pre-configured software and interface solutions. Operation and maintenance require a minimum of staff on site and remote monitoring is possible. Trouble-shooting is quick and spare part availability is good. All this due to advanced standardization.

The standardized design of the Power Cubes also lifts the concept of “step-wise” investment to new heights. Starting with just a single Cube, you can easily expand the installation by adding new, interconnected Cubes. As the demand for power grows so will your plant.

ADVANTAGES OF CUBE DESIGN:

- Validated and reliable technical solutions
- High electrical efficiency through minimization of the plant’s own consumption
- Compact design and a minimized annex system
- Fluent and cost-efficient project execution from planning to start-up
- Optimized lifetime support and reduced warranty costs
- Future expansion flexibility.

GasCube BONTANG, INDONESIA

Customer ............................................ PT PLN (Utility)
Type ............................................. Wärtsilä GasCube power plant
Operating mode .................................. Flexible baseload
Engines .............................................. 2 x Wärtsilä 16V34SG
Total output ......................................... 13.9 MW
Fuel .................................................... Natural gas
Scope .............................................. EPC (Engineering, Procurement & Construction)
Delivered ............................................. 2009

Are you looking for a great package deal for power generation in the 5-30 MW range?

With our GasCube and OilCube power generation solutions for smaller power plants, you enjoy the same big benefits as our customers for large turnkey power plants: proven technical and logistical solutions and reliable delivery schedules guaranteed by a single supplier.

The Wärtsilä Power Cubes are modular, pre-engineered single-engine power plants produced within a cost framework that justifies turnkey deliveries for small plants while still complying with the needs of different clients and applications.
The very cost-efficient Wärtsilä GasCube is a complete one-engine power plant, based on the Wärtsilä 34SG, with all the auxiliaries and components needed to make up a working power production unit, providing up to 10 MWe per unit. It is a compact solution that enables fast delivery, easy installation and care-free operation.

The Wärtsilä GasCube consists of a cubical enclosure that has the engine and the alternator located on a common baseframe. The inlet air module, charge air silencers, exhaust gas system and an auxiliary module are all connected to the genset.

The auxiliary module includes a gas-regulating unit, the cooling system, an instrument air system, and an engine pre-heater. All auxiliaries are located in the modules.

The radiators for engine cooling are installed on the roof of the enclosure. The starting air vessel and the maintenance water tank are installed next to the auxiliary module. The only major component not located on the auxiliary module is the starting air compressor next to it.

The closed-circuit cooling systems used in the GasCube make it the perfect choice for remote locations or any location in which water is scarce.

All Wärtsilä gas power plants are also designed to give full output and high performance in hot and dry conditions, as well as at high altitudes.

New possibilities for Cube placement are opened up by the Cube’s simple interface and small footprint. A typical storage yard of an industrial company, for example, would be more than adequate as a location for this compact solution offering excellent power density.
MAIN TECHNICAL DATA

Engines .................................................... Wärtsilä 16V34SG, 20V34SG, 16V34LPG, 20V34LPG
Ambient temperature ..................................................... -5…+40 °C (+45 special arrangements)
Noise level ........................................................................................................... 70 dB(A) 100 m
Gas regulating unit .............................................................................................. Wärtsilä design
Control ...................................................................................................... Power house / remote
Cooling .................................................................................................................... Single circuit
Radiator ...................................................................................................................... On the roof
Ventilation ........................................................................................................ Free in, forced out
Max temperature inside power house ............................................................................... +50 °C

GasCube power outputs

<table>
<thead>
<tr>
<th>50 Hz</th>
<th>16V34SG</th>
<th>20V34SG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power, electrical kW</td>
<td>7740</td>
<td>9730</td>
</tr>
<tr>
<td>60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power, electrical kW</td>
<td>7430</td>
<td>9340</td>
</tr>
</tbody>
</table>

Generating set dimensions and dry weight*

<table>
<thead>
<tr>
<th></th>
<th>16V34SG</th>
<th>20V34SG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length mm</td>
<td>11187</td>
<td>12917</td>
</tr>
<tr>
<td>Width mm</td>
<td>3345</td>
<td>3345</td>
</tr>
<tr>
<td>Height mm</td>
<td>4475</td>
<td>4501</td>
</tr>
<tr>
<td>Weight tonne</td>
<td>120</td>
<td>130</td>
</tr>
</tbody>
</table>

*Genset dry weight includes spring mounted shock absorbers and inlet cones; excludes lube oil and cooling fluids.
The Wärtsilä OilCube is a complete single-unit power plant. The Wärtsilä 20V32 engine version is designed to meet a power demand of 5 to 30 MW. 12 and 16 cylinder engine versions are also available as options.

The design of the Wärtsilä OilCube is compact. Nevertheless, it includes a modular heavy fuel oil (HFO) treatment system consisting of two separators and a tank with separated fuel.

The electricity consumption for HFO heating is minimized by utilizing heat taken from the engine cooling water and lubrication oil systems. A closed-circuit cooling water system keeps the need for water down to a minimum. And radiators placed on the roof ensure the most efficient cooling in all circumstances.

Power Cubes have a low-voltage electrical system inside the cube that includes a plant programmable logic control (PLC) and a panel mounted WOIS™ (Wärtsilä Operator’s Interface System). Thus, the plants can be monitored and partly operated remotely by WOIS.
OilCube power outputs

<table>
<thead>
<tr>
<th>Frequency</th>
<th>50 Hz</th>
<th>60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power, electrical kW</td>
<td>5790, 7740, 8730, 9730</td>
<td>5560, 7430, 8380, 9340</td>
</tr>
</tbody>
</table>

Generating set dimensions and dry weight*

<table>
<thead>
<tr>
<th>Measurement</th>
<th>50 Hz</th>
<th>60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length mm</td>
<td>10226</td>
<td>5600</td>
</tr>
<tr>
<td>Width mm</td>
<td>3000</td>
<td>3300</td>
</tr>
<tr>
<td>Height mm</td>
<td>4104</td>
<td>4638</td>
</tr>
<tr>
<td>Weight tonne</td>
<td>92</td>
<td>117</td>
</tr>
</tbody>
</table>

*Genset dry weight includes spring-mounted shock absorbers and inlet cones; excludes lube oil and cooling fluids.

MAIN TECHNICAL DATA

Engines: Wärtsilä 12V32, 16V32, 18V32, 20V32, 20V32TS, 16V34DF, 20V34DF

Ambient temperature: 0…+50 °C

Noise level: 70 dB(A) 100 m

OilCube auxiliary module: Fuel booster pump, Fuel mass flow metering, Fuel viscosity metering, Automated HFO heating, Automated LFO cooling, Thermostatic valves, HT pre-heater, Sludge collection

OilCube treatment module: 2 x fully automated HFO separators, HFO heating with engine HT water, Separated fuel tank, LO separator with LO/LO heat recovery

Control system local: Local control in engine hall, remote monitoring station

Cooling radiator: Single circuit, low noise on the roof

Ventilation: Forced in, free out

SITE PLAN
FAST AND FLEXIBLE IN PERU
The Wärtsilä 34DF is a central feature of our OilCube solution. This pre-engineered power plant concept is widely used in turnkey contract deliveries to provide fast and flexible installation. Its modular design enables easy expansion of the plant as demand increases. One such recent project is an order for a Wärtsilä 34DF OilCube to be installed at an open cycle gas turbine power project in Eten-Chiclayo, 750 km north of Lima, the capital of Peru.

The open cycle plant will be based on a dual-fuel gas turbine with an output of 218 MW. One of the technical requirements is that the plant shall be capable of black-start operation, i.e. without power from the grid. This means that the plant requires a generating unit to provide the power needed to start the gas turbine. The size of this starting generating unit has been estimated at 8–10 MW.

It is an application for which the Wärtsilä 34DF is well suited. The compact, space saving, and fully engineered solution offers both high efficiency and complete fuel flexibility.

The plant owner will be paid according to the emergency plant’s installed capacity. However, due to the highly flexible dynamic capabilities of the Wärtsilä 34DF, the owner decided that it would not only use Wärtsilä’s generating unit for providing black-start power, but also to deliver additional power when the entire plant is operating, or when the System Operator so requires. This would give the plant a total generating capacity of 218 MW + 8.2 MW.

The Power Cube therefore has two start-up scenarios:
1. Standard start up: The plant is connected to the grid, from which both the gas turbine and the Wärtsilä engine take the power needed to start and synchronize with the grid, and then go to full or the required load.
2. Black-start: The plant is disconnected from the grid; the Wärtsilä 34DF engine starts first to provide the power needed to start the main turbine.
OilCube LIHIR, PAPUA NEW GUINEA
Customer ............................................... Lihir Gold Limited (Industry – mining)
Type ...................................................... Wärtsilä OilCube power plant
Operating mode ........................................ Baseload
Engines ................................................... 2 x Wärtsilä 20V32
Total output ............................................. 18 MW
Fuel ....................................................... HFO
Scope .................................................... EEQ (Engineered Equipment Delivery)
Delivered ................................................ 2013

OilCube RESERVA FRIA ETEN, PERU
Customer ............................................... Cobra Group
Type ...................................................... Wärtsilä OilCube power plant
Operating mode ...................................... Peak load, standby & emergency
Genset ................................................... 1 x Wärtsilä 20V34DF
Total output ........................................... 8.7 MW
Fuel ....................................................... Natural gas & LFO
Scope .................................................... EEQ (Engineered Equipment Delivery)
Delivered ................................................ 2015
SERVICES FOR POWER PLANTS

Wärtsilä is an experienced operator, with a proven track record in operation and maintenance services since the 1990’s. Globally, nearly 19 GW of generating capacity in both marine and land-based installations – totaling over 470 installations – is covered by Wärtsilä’s service agreements. Out of these, over 4.7 GW, comprising more than 130 installations, are covered by power maintenance agreements.

Wärtsilä provides full service throughout the product lifecycle for both marine and power plant customers, and is constantly developing its worldwide network. Our Services organization currently features 11,000 dedicated service professionals in 70 countries.

For power plant applications, our service solutions cover everything from basic support with parts, field service and technical support to complete service agreements; from installation and commissioning, performance optimization, including upgrades and conversions, to environmental solutions, training, technical information and online support.

The choice available extends from parts and maintenance services to a variety of comprehensive, customized long-term service agreements, including performance guarantees, and operations & management agreements.

Wärtsilä adds value to your business at every stage in the lifecycle of your installations. With us as your service partner, you receive many measurable and guaranteed benefits such as availability and performance, productivity gains and cost benefits. Above all, you get peace of mind knowing that your installation is being serviced by the most experienced partner you could have.
THINKING INSIDE THE BOX PROVED WORTHWHILE IN BONTANG, BORNEO

The challenges were many for the very first Wärtsilä GasCube plants delivered to Bontang on the island of Borneo, Indonesia. Still, the Cubes succeeded in taking the customer by surprise as they were finished ahead of a tight schedule in May 2009.

As the demand for electricity is on the rise, the Indonesian government has initiated programmes for increased generating capacity. In Bontang the existing power plant needed to be backed up by an easy-maintenance and highly reliable solution. A smart assembly kit plant for a limited space, but with high net power output, was just what was needed.

The Wärtsilä GasCube, with a footprint of only 113 square metres, made it a perfect fit. The two units have one Wärtsilä 16V34SG engine each. They run on locally supplied natural gas and have a total output of 14 MW. The variable frequency drives reduce auxiliary power consumption, resulting in a higher net power output.

One of the innovative design features of the Cube is that the radiators are mounted on the roof, which makes separate supports and foundations unnecessary and also improves the cooling performance which is a significant benefit in hot climates. With its closed-circuit cooling system even the water consumption is reduced to a minimum.

The GasCubes were assembled on-site from prefabricated modules and the contract covered engineering, delivery, construction and commissioning of the power plants including the gensets, auxiliary equipment and building structures.

GasCube BONTANG, INDONESIA

Customer ............................................ PT PLN (Utility)
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Fuel ........................................................ Natural gas
Scope, EPC (Engineering, Procurement & Construction) Delivered ........................................2009
Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.